AMINO ACID COMPOSITION OF FOUR TILAPIAS

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ABSTRACT

Adult *Tilapia zilliii, Sarotherodon galilaeus, Oreochromis aureus* and *O. niloticus* were obtained from National Institute for Freshwater Fisheries Research hatchery. They were oven dried at 60°C for 50hours. The dried samples were taken for amino acid analysis using Technichon TSM – 1Ssequential Multisample Auto-Analyzer equipped with a pen recorder for drawing chromatograms. Statistical analysis of the amino acid composition showed significant difference ($P<0.01$) among species. The correlation coefficient showed very high correlation ramong the species and other sizes of *O. niloticus* (0.712-0.933)

INTRODUCTION

Oreochromis niloticus, *S. galillaeus*, *O. aureus* and *T. zillii* are commonly and widely cultured tilapia species in Nigeria. The knowledge of amino acid profile of these tilapias is useful in formulating feed for their maximum growth performance and protein deposition. Amino acids are building blocks of protein. They make up about 16% of the carcass of whole fish. According to Miles and Chapman (2007), the ideal protein in fish feed is that which provides the exact balance of amino acids needed for optimum performance and maximum growth. Miles and Chapman (2007) also stated that fish do not have a specific protein requirement but rather a definite requirement for amino acids that the use of such diet reduces the amino acids used for energy, therefore, the feed is efficiently utilized for maintenance, health and synthesis of new structural protein. Earlier studies on the lysine requirement for *O. niloticus* showed that fry and fingerlings require 7.30g and 7.14g lysine/100g protein (Ovie, in press); *O. mossambicus* 4.1g (NRC 1993) and *O. niloticus* 5.1g (NRC 1993). Other studies showed that there is a close correlation between essential amino acid of fish and essential amino acid profile of whole body tissue of the fish (Rumey and Ketola 1975; Arai, 1981; Wilson and Poe 1985; Wilson and Cowey 1985; Cowey and Tacon, 1987; Wilson and Moreau 1996). This study was carried out to ascertain the amino acid composition of four tilapias, forming a framework on which further studies on amino acid requirements of these species would be built upon.

MATERIALS AND METHODS

Adult *O. niloticus* (650g), *S. galilaeus* (300g), *O. aureus* (320g) and *T. zilliii* (120g) were obtained from National Institute for Freshwater Fisheries Research hatchery. They were oven dried at 60°C for 50 hrs, allowed to cool and wrapped in polythene bags. The Technicon TSM-1 Sequential Multisample analyzer (model DNA 0209) was used in the hydrolysis of the samples. Each sample was separately defatted by inserting 10g of the sample into an extraction thimble and extracting the fat with a 2:1 chloroform/methanol mixture using a Soxlet extraction apparatus (AOAC 1980). Extraction was done in triplicates. Extraction lasted 15 hours. Defatted samples were weighed into glass ampoules and 7 ml of 6N HCL was added. Oxygen was expelled by introducing nitrogen into the ampoule to prevent oxidation of amino acids during hydrolysis. The glass ampoule was sealed with burnsen burner flame and put into an oven preset at 105± 50C for 22 hours. The ampoule was allowed to cool before being broken open at the tip and the contents were filtered. The filtrate was evaporated to dryness to at 400C in a vacuum in a rotatory evaporator. The residue was dissolved with 5ml of acetate buffer (pH 2.0) and stored in plastic specimen bottles in a freezer. 10 ml was poaded and dispensed into the catridge of a TSM analyzer (Technicon Sequential Multisample Amino Acid Analyzer) that separated free acidic, neutral and basic amino acids of the hydrolysate into chromatograms in 76 minutes. At each peak produced by the TSM chart record (each peak represents an amino acid), the half height was measured. The area of the peak was approximated by multiplying the height of the peak by the width at half height. The norleucine equivalent (NE) for each amino acid was calculated using the formular: NE = area of norleucine peak/ area of each amino acid. A constant (S) was calculated for each amino acid in the standard mixture according to the formula: S = NE x mol. Wt x UMAA. Finally, the amount of each amino acid in the sample was calculated in g/16 g N or g/100g protein using the following formula: concentration (g/100 g protein) = NE x width at NE x S x C, where C = dilution/NH x W (nieu). Statistical analysis was carried out by using the computer package SPSS version 10 to correlate bivariates of samples

RESULTS AND DISCUSSION

Table 1 shows the amino acid composition of tilapias and previous analysis done for *O. niloticus* fingerlings (Dairiki *et al.*, 2007). Nine essential amino acids were available as in previous studies conducted on amino acids of three species in northern Nigeria (Sadiku and Oladimeji 1989); *Heterobranchus longifilis* (Ovie and Ovie 2007); *H. longifilis* and *C. anguillaris* (Eyo 1999). Methionine was the lowest in proportion to other amino acids in all four tilapias. This is similar to the findings of Sadiku and Oladimeji (1989), Eyo (1999) and Ovie and Ovie (2007). Glutamic acid was highest in proportion to other non – essential amino in the four tilapias. This is similar to other studies of this nature for Coho salmon (Arai, 1981); Cherry salmon (Ogata et al., 1983); Atlantic salmon (Wilson and Cowey 1985); Channel catfish (Wilson and Poe 1985); three species of northern Nigeria (Sadiku and Oladimeji 1989); *H. longifilis* and *C. anguillaris* (Eyo, 1999); *H. longifilis* fry, fingerlings and broodstock (Ovie and Ovie 2007). However, the quantity of glutamic acid in the tilapias is lower than that available in the fry and fingerlings of *H. longifilis* (Ovie and Ovie 2007; Eyo 1999); Coho salmon (Arai, 1981); Cherry salmon (Ogata et al., 1983); Atlantic salmon (Wilson and Cowey 1985); Channel catfish (Wilson and Poe 1985).

Table 1: Amino Acid Composition of tilapias (g/100g Protein)

	Adult *O. niloticus*	*S. galillaeus*	*O. aureus*	*T. zilliii*	Fingerlings *O. niloticus*	*O. niloticus* (Dairiki *et al.*, 2007)
Lysine	7.51	8.12	7.88	8.27	5.30	6.34
Histidine	2.39	2.59	2.71	2.71	2.24	1.55
Arginine	6.04	5.18	5.18	6.21	5.01	4.36
Aspartic acid	8.19	9.49	9.68	9.68	7.85	
Threonine	4.03	4.58	4.36	4.58	3.23	3.25
Serine	4.01	4.18	3.47	4.34	3.66	
Glutamic acid	13.63	13.93	13.18	14.09	10.23	
Proline	4.45	4.27	4.68	4.60	3.87	
Glycine	7.25	7.50	7.40	7.54	4.13	
Alanine	6.46	4.41	6.38	6.46	4.48	
Cystine	0.71	0.75	0.79	0.80	0.79	
Valine	4.80	4.74	4.68	4.91	4.10	3.50
Methionine	2.40	2.50	2.42	2.55	2.19	2.18
Isoleucine	3.99	3.93	4.00	4.12	3.49	3.22
Leucine	7.05	7.10	6.94	7.32	6.25	5.89
Tyrosine	2.86	3.17	2.85	3.17	3.18	2.65
Phenylalanine	3.77	4.11	3.94	4.28	3.51	3.32

Among the essential amino acids lysine had the highest component of the various species except for fingerlings of *O. niloticus* which had leucine as highest. The non- essential amino acids has glutamic acid as the highest. Methionine was the least in quantity for the essential amino acid while cystine was the least for NEAA. Miles and Chapman (2007) reported that fish feed containing the exact amount of essential amino acids required by the species especially for deposition of lean body tissue, there would be no amino acid deficiency of excess. The essence of this study for Tilapia species is for feed processors to formulate diets to meet the exact needs for these species. This would go a long way to reduce the operational cost and reduce the amount of nitrogen released by the fish as ammonia (Miles and Chapman 2007).

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